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Laser damage threshold dependence on overlayer film thickness for non-normal incidence hafnia-silica high reflectors

C. C. Walton, F. Y. Genin, R. Chow, M. R. Kozlowski, E. Pierce and G. Loomis
Lawrence Livermore National Laboratory
P.O. Box 808, L-476
Livermore, CA 94550
Phone: (510)-423-3802
FAX: (510)-422-0127

Abstract

Hafnia-silica multilayers were deposited by reactive e-beam evaporation onto glass substrates; the periodic stack was designed to operate as a high reflector (HR) at 1.06μm wavelength and 56° incidence. Overlayers of silica with optical thicknesses from 0 to 4λ were deposited onto the HRs. The stress and the laser damage threshold for s- and p-polarization were measured, and the morphology of the damage was characterized using atomic force microscopy. The multilayers were found to be under compression, with an intrinsic stress increasing with overlayer thickness. The overlayer thickness had little effect on the damage threshold, but with thicker overlayers the size of the damaged area increased. For these high incident angle coatings the damage occurred in the top 2-4 layers with the morphology clearly influenced by layer interfaces. There was no clear indication of the nodule defect initiated damage commonly observed for low angle HRs.

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